REMARKS

Claim Rejections - 35 U.S.C. § 112, First Paragraph

The Examiner has rejected claims 19-21 and 26-28 as containing informalities. Claims 19-21 have been amended accordingly.

Claim Rejections – 35 U.S.C. § 103

The Examiner has rejected claims 1-6, 9-13, 15-16, and 18 under 35 U.S.C. 103(a) as being unpatentable over Chapple-Sokol (U.S. Patent No. 5,612,255). More specifically, Examiner stated that Chapple-Sokol teaches the formation of quantum wires by forming a single polysilicon mask on a substrate, then etching the substrate to form the one dimension quantum wires. Although Examiner recognizes that Chapple-Sokol does ***not*** teach the practice of forming spacers on spacers to further reduce the size of a quantum wire, the Examiner nevertheless stated that "it would be obvious to one skilled in the art to merely duplicate the Chapple-Sokol process twice to further reduce the width of the wire."

The Applicants respectfully disagree. Applicants respectfully contend that it would **not** be obvious to one skilled in the art to merely duplicate the Chappel-Sokol process, as suggested by the Examiner, to produce a method as claimed in independent claims 1, 16, 22 and 39 (encompassing the rejected claims.) A "mere duplication" would suggest a method that actually teaches against the independent claims 1, 16, 22 and 39. Therefore, the method taught by the Chapple-Sokol reference would actually require a unique modification to produce the method as claimed in the independent claims 1, 16,

22 and 39, which unique modification is not taught by the cited art or explained by the Examiner's reasoning.

First of all, elaborating more specifically on the contentions stated above, the Applicants contend that even if the Chapple-Sokol process were merely duplicated, the duplication would not suggest the limitations of the claims. The Applicants will first describe the flow of the Chappel-Sokol process as taught in FIG. 1A-1C of Chappel-Sokol, then the Applicants will show that a mere duplication of Chappel-Sokol process would suggest to one skilled in the art a method that actually teaches against the independent claims 1, 16, 22 and 39. First, the flow of the Chappel-Sokol invention is as follows: in FIG. 1A of Chappel-Sokol, a polysilicon layer 104 is deposited over a substrate 100 and over thick oxide pads 102; in FIG. 1B, the polysilicon layer 104 is etched forming thin polysilicon sidewalls 106 next to the thick oxide pads 102; then in FIG. 1C, the thick oxide pads 102 are removed. Supposedly, at this point, the Examiner suggests that it would be obvious to repeat the Chappel-Sokol process to form a second spacer, thus allowing the quantum wires to be formed smaller.

However, Chappel-Sokol only teaches the formation of a spacer with the use of one material - polysilicon. Hence, if the Chappel-Sokol, process were repeated to form a second spacer, starting at FIG. 1C, a second polysilicon layer would be deposited over the polysilicon sidewalls 106, as taught in FIG. 1A. The second polysilicon, as a "mere duplication" would be made of the same material (polysilicon) and would have the same thickness as the first polysilicon layer 104. The result would be a merging of the polysilicon sidewalls 106 with the formation of the second polysilicon layer. Thus, even if an anisotropic etch were applied, as taught in FIG. 1B of Chappel-Sokol, then both the newly formed layer of polysilicon as well as the polysilicon sidewalls 106 would be etched. Consequently, the mere duplication of the Chappel-Sokol process would not cause thinner polysilicon masks that form smaller quantum wires, but rather would form

wider polysilicon masks that form larger quantum wires. Consequently, if the Examiner is suggesting that it would be obvious based on a "mere duplication" of the Chappel-Sokol process, then the reformation of the second polysilicon layer would actually suggest a method that teaches against the claims limitations of the independent claims 1, 16, 22, and 39,

To the contrary, the independent claims 1, 16, 22, and 39 require that a first "nitride" and a first "oxide" spacer mask be formed. The "nitride" material of the first spacer mask is a different material from the "oxide" material of the second spacer mask so that both the oxide and nitride materials can be respectively etched with selective chemistries that do not interfere with each other. A subsequent, second "nitride" spacer mask can be formed. The second nitride spacer mask is made from a nitride material, which is a different material from the previously formed first "oxide" spacer. The second nitride spacer mask is then utilized to form the quantum wires.

For further sake of argument, Applicants will suppose that Examiner may instead be suggesting that that the oxide pads 102, as shown in FIG. 1A could be substituted as a second spacer. However, the oxide pads 102 are taught as being much thicker than the polysilicon layer 104. Hence, the "mere duplication" of the oxide pads 102 would actually produce oxide structures that would be much thicker than the polysilicon spacers 106. Hence, the final width of the quantum wire would not be "reduced", as suggested by the Examiner, but rather would be increased. Consequently, a "mere repetition" of the Chappel-Sokol process by reforming the oxide pads 102 after the formation of the polysilicon sidewalls 106 would also suggest a method that teaches against the claims limitations of the independent claims 1, 16, 22, and 39.

If, therefore, Chappel-Sokol does not suggest an obvious modification by a "mere duplication" of the Chappel-Sokol process, then the Examiner must be thinking of a unique modification that is not suggested or taught by the Chappel-Sokol reference. Such

a unique modification is not supported by any of the cited art references or by cogent scientific or legal arguments from the Examiner. The only obviousness argument provided by the Examiner is the "mere duplication" argument.

Thus, in summary, it can be seen that the Examiner's argument that the claim limitations would be obvious based on a "mere duplication" of the Chappel-Sokol process is unconvincing. The Chappel-Sokol teachings would need to be uniquely modified in a manner that is not described by the art, or by the Examiner. Therefore, the rejection by the Examiner must be motivated by the benefit of hindsight from disclosure only found in the application, and, therefore, the 35 U.S.C. 103(a) rejection based on Chapple-Sokol is impermissible, and should be removed.

Applicants further argue that a "polysilicon" sidewall, as taught by Chapple-Sokol, is not equivalent to a "nitride" mask as required by the limitations of the claims. More specifically, etch processing has disparate results between nitride materials and polysilicon materials regarding their use as etch masks. Etch chemistries vary depending on whether a nitride is used as a mask as opposed to whether polysilicon is used as a mask.

To illustrate this point, one advantageous difference between the use of a nitride material as taught by independent claims 1, 16, 22, and 39, as opposed to a polysilicon material, as taught by Chapple-Sokol, is that the etch chemistry utilized to etch away the polysilicon material would actually etch an underlying silicon substrate at the same time that the polysilicon mask was etched. For example, Chapple-Sokol teaches the removal of the polysilicon sidewalls 106 *at the same time*, and by the same etch chemistry, as that of the silicon substrate 108. This process is described in in Column 2, lines 60-63, of Chapple-Sokol. The exact language states that "the substrate surface 108 is removed from between the sidewalls 106 as the poly sidewalls 106 are removed." Thus, Chapple-Sokol teaches the use of the polysilicon sidewalls 106 so that the same etch chemistry can

be utilized to remove the sidewalls 106 at the same time that the quantum wires are formed upon the silicon substrate 108. Thus, the choice of polysilicon as a mask, as taught by Chapple-Sokol, would not even support the formation of a second spacer mask since the underlying substrate material would be etched by the same etch chemistry, and therefore would be removed, whenever the first polysilicon mask was etched.

The use of a "nitride" material, as the spacer mask, however, as taught by the independent claims independent claims 1, 16, 22, and 39, is advantageous since it allows for the formation and removal of a second spacer, the "first oxide spacer mask" and a third spacer, the "second nitride spacer mask" all without actually etching the underlying silicon layer. Thus, it can be seen that even the very material used to form the masks are advantageous to the method taught in the independent claims 1, 16, 22, and 39 and that the wrong material, such as polysilicon, would actually teach contrary to the method claimed in the independent claims 1, 16, 22, and 39.

The Examiner has rejected claims 7-8, 17, 19-28, and 39-47 under 35 U.S.C. 103(a) as being unpatentable over Chapple-Sokol as applied to claims 1-6, 9-16, and 18 above, and further in view of Kendall (Kreidl Memorial Lecture, Oct. 30, 1995). However, Kendall also does not contain any teachings that teach or suggest a method of utilizing a first "nitride" spacer mask, a first "oxide" spacer mask, and a second "nitride" spacer mask, in the formation of a quantum wire. In fact, the only description in Kendall of any methodology that teaches or suggests any kind of formation of quantum wires is the use of "cross laser beam interferometry" (see page 1, fourth paragraph). The Applicants fail to see, however, how "cross laser beam interferometry", either alone or in combination with Chapple-Sokol, teaches or suggests a method comprising the formation of a first "nitride" spacer mask, a first "oxide" spacer mask, and a second "nitride" spacer mask, as required by the independent claims 1, 16, 22, and 39.

CONCLUSION

Applicants respectfully submit the present application is in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call Michael Bernadicou at (408) 720-8300. Authorization is hereby given to charge our Deposit Account No. 02-2666 for any charges that may be due.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

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